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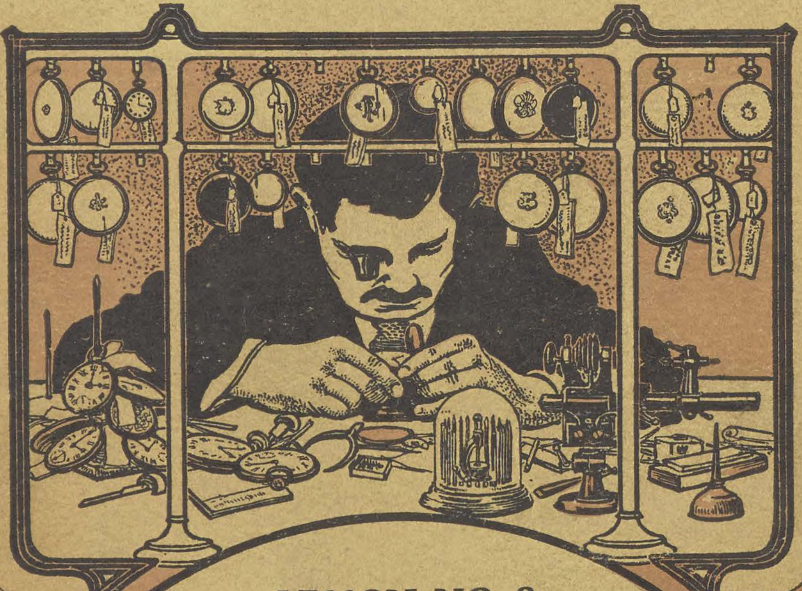

LESSON NO. 3

Rogers, Thurman & Co.

(INCORPORATED)

Jewelers Wholesale
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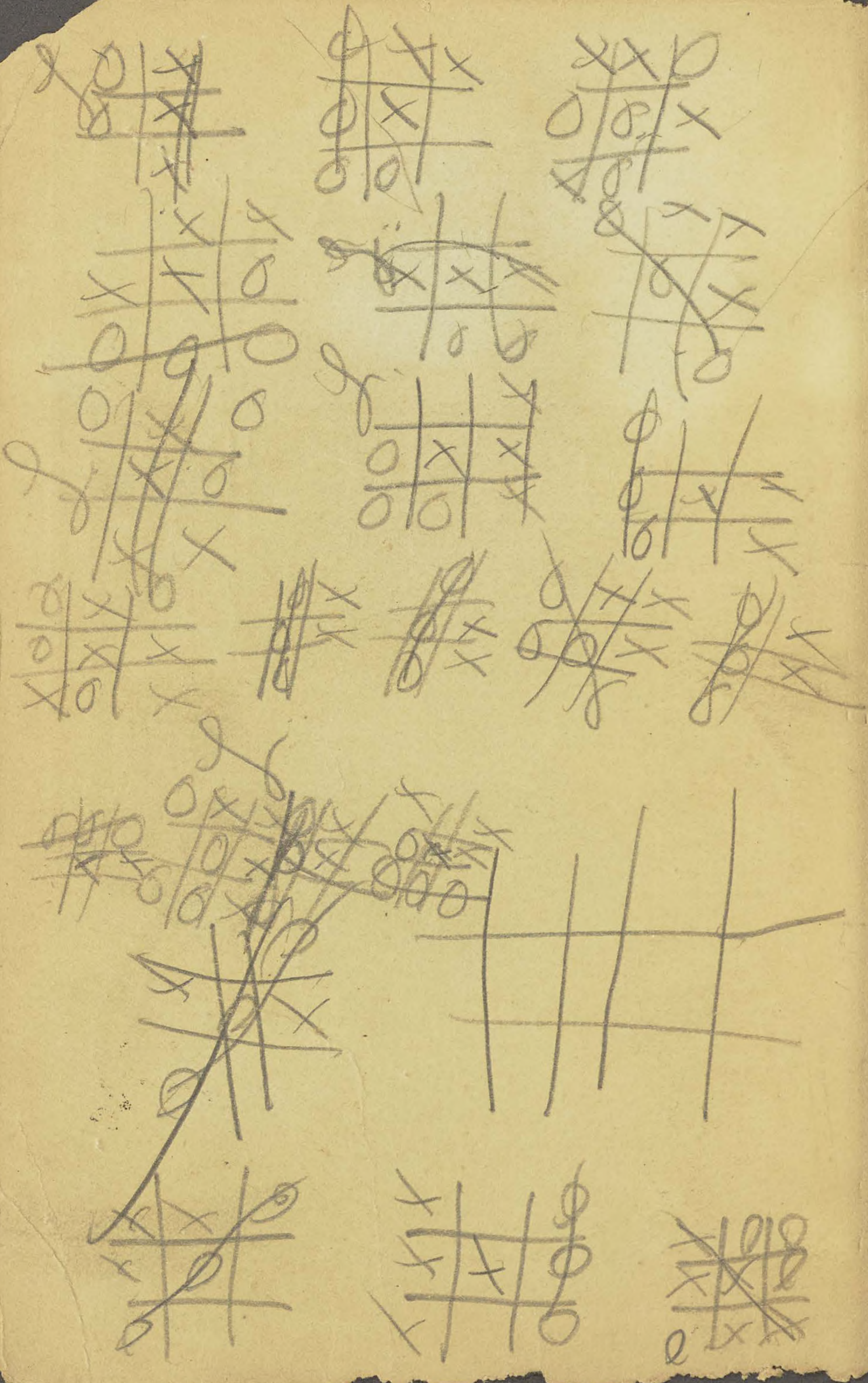

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LESSON NO. 3

Paragraph No. 1

How to Replace the Balance and Cap Jewels

¶ After cleaning a watch, the first operation when putting it together is to put the balance and cap jewels in the potance, which is attached to the top plate. (See figure 1.) You first put the balance jewel in place and force it down with your jewel pusher. Have the concave surface of the balance jewel facing down toward the top plate. Now put the end stone in and force it on with jewel pusher until the setting is flush with the top surface of the potance. There are two counter sunk holes for the jewel screws in the potance, also two in the setting of the cap jewel. When you put the cap jewel in place, see that these holes are opposite each other so that when the jewel screws are set they will also be flush with the surface of the potance. (See figure 2.) Fasten the jewels in with the two jewel screws, using your smallest size watch screw driver and be careful not to use too much force or you will break the screw heads. Never let your screw driver slip from the screw head slot or it will scratch and mar the movement plate. Also do not handle the parts more than is absolutely necessary or they will be covered with finger-marks and will present a bad appearance. Oil the balance jewel from the inside with your watch oiler No. 3915. Dip the oiler in oil cup No. 2801, in which you have poured a few drops of oil, and simply touch the jewel. The oil carried on the point of the oiler is sufficient.

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Paragraph No. 2

Replacing the Train Wheels and Pallet

℄ Lay the pillar plate in your movement rest No. 3909 and put in the center, third, fourth and escape wheels. (See figure 3) in the order in which they are named. With your watch oiler put oil on the pallet stones, then put the pallet fork and arbor in its place on the top plate and proceed as shown in figure 4. Use your eye glass when doing this work. The end of the pallet fork goes inside of the potance and must be put in there very carefully with a tweezer. (See figure 5). Push it in until the pivot on the pallet arbor will enter its pivot hole. When it is in position, grasp the top plate and pallet with your tweezer as shown in figure 6 and put into proper place on the pillar plate. Now remove your tweezer and hold the watch movement in your left hand with your forefinger resting on the top plate to prevent the plates from falling apart. Hold the movement so that you can see between the plates and with your tweezer you can adjust all of the pinions, so that each one will enter its proper pivot hole. When they are all in position, press the top plate down very carefully. If there is any resistance, do not force it into place, because the trouble is caused by one or more of the pinions being placed so they will not enter the pivot hole, and if you force the plate down you will break the pivots. This is one of the most difficult operations, but can be easily done if you are careful. After the two plates are in place, fasten them together with the three pillar plate screws. The directions in this paragraph apply only to eighteen size watch movements, where the pallets are not exposed, making it more difficult to assemble these parts.

Rogers, Thurman & Co. Chicago, Illinois

Any one who has learned to assemble an eighteen size movement will have no trouble with the smaller sizes, as the pallet fork and arbor has a separate bridge, called the pallet bridge.

Paragraph No. 3

Explaining End and Side Shake and Replacing Winding Parts

❡ After these parts have been assembled, test the pallet fork and arbor. See that it moves freely and does not bind. All of the wheels should have a little "end shake" and "side shake." End shake means the play from end to end and is the extra distance between the movement plates allowed for pinions to prevent friction. Side shake means the play from side to side. This is obtained by having the pivot holes a trifle larger than the pivots and is necessary to prevent friction. Remember what these two terms mean because they will be used hereafter in the different lessons. You now place the movement on the movement rest with the top plate down and put on winding and setting wheels and the yoke. (See figure 7.) Oil these parts with your watch oiler, also oil the winding pinion. Never put oil on any part of a watch movement without using a watch oiler. Too much oil will prevent a movement from running. After the parts have been oiled, fasten them firmly in place with the screw intended for this purpose. Test these parts with your tweezer and see that they are free and do not bind. The teeth of the main winding wheel must mesh with the winding pinion. You can test the adjustment of the winding and setting parts with your bench key.

Paragraph No. 4

Putting the Mainspring in the Barrel

℄ Reverse the movement on the movement rest with top plate up, ready to receive the mainspring barrel. It is now necessary to put the mainspring in the barrel. Before doing this, examine the barrel and you will notice a small hole in the bottom near the rim, or there will be a small projection on the inside of the rim, used for holding the outer end of the mainspring in place when it is wound up. (See figure 8.) After examining the barrel wind the mainspring on the mainspring winder No. 2469, as shown in figure 9, and put it in the barrel by placing the barrel over the end of the mainspring winder. When the spring is inside of the barrel, release it from the mainspring winder and see that the outer end of the coil is hooked on the catch or small hole in the barrel made for this purpose. You now put the barrel arbor in the barrel. (See figure 10.) Hold the arbor in a pair of flat pliers No. 4103 and push it down through the inner coil of the mainspring into position. (See figure 11.) The hole on the inner coil must catch on the hook of the barrel arbor. If it does not fit properly, bend the spring with mainspring plier No. 4305. After fitting the spring, oil it with watch oiler in three different places. You now put the barrel head on. See that the small hole in the edge of the barrel head fits over the hook on the outer end of the mainspring before forcing the head down into position. Be sure to have it on tight. It must be perfectly flush on all sides with the edge of the barrel and if necessary can be forced into place by pressing it against the edge of your bench.

Paragraph No. 5

Putting in the Mainspring Barrel

❡ Before placing the mainspring barrel in the movement, oil both ends of the barrel arbor, then put the ratchet wheel in its place on the movement plate and see that the click locks in the teeth of the wheel. You will notice that the ratchet wheel has a square hole in the center. This hole is for admitting the square on the end of the barrel arbor. Put the mainspring barrel in place and with your tweezer turn the barrel arbor until it enters the square hole in the ratchet wheel. You then put on the barrel bridge and fasten securely with the two bridge screws. (See figure 12.) The above directions apply to Elgin movements. The Waltham, Hampden and Illinois movements are made with the ratchet wheel on the opposite side of the movement plate. When replacing the mainspring barrel in these movements, you put the barrel in place, fasten on the barrel bridge, then turn the movement over and put on the ratchet wheel and ratchet bridge. It is well to explain here that the ratchet wheel works in connection with the winding parts of the movement. When the watch is being wound, the ratchet wheel turns the barrel arbor on which the mainspring is coiled, thus producing the power that makes the movement run. You now turn the movement over with top plate down and proceed as described in paragraph 6.

Paragraph No. 6

Oiling the Pivots, Replacing the Dial and Hands

❡ Put oil in the pivot holes of the third wheel, fourth wheel, escape wheel, barrel arbor, center wheel and pallet arbor with your watch oiler. Do not use too much oil.

Then put on the canon pinion, minute and hour wheels (see figure 13), replace the dial and see that the fourth pinion comes directly under the hole in the dial for the second hand, as this is the pinion that carries the second hand. Then tighten the three dial screws, using your smallest size screw driver. Now put on the second hand. The pipe of the second hand fits down over the fourth pinion and is held in place by friction. Place it on the pinion and press down with your tweezer until the hand is in the proper place. Do not force it too far down on the pinion. The hand must turn without touching the dial. It also must not interfere with the hour and minute hands. See that the adjustment is perfect or the watch will not run. If the hole in the pipe of the second hand is too small, enlarge it with a pivot broach, selected from your set No. 2008. You should have a No. 3212 broach holder, when using pivot broaches. You now put on the hour hand and minute hand. Force them down into proper position by using a hollow punch selected from your staking tool No. 4614. You will notice that the center of the hour wheel projects above the dial and that the canon pinion passes through and extends beyond this projection. It is necessary to have the hour hand perfectly flush with the top of the hour wheel and the minute hand after being fitted on the canon pinion must leave a space between the two hands so that the hour wheel will have sufficient end shake. The hands must not interfere with each other or must not rub on the dial. If there is not sufficient end shake the watch movement will not run.

Paragraph No. 7

Replacing the Balance Wheel, Roller Table and Hairspring

❡ Turn the watch on the movement rest with the dial down. You are going to replace the balance wheel with its different attachments and must follow the directions very carefully to achieve satisfactory results. With your tweezer place the roller table on the balance staff with the roller jewel opposite the mark you made on the rim of the balance wheel. Place these parts in your staking tool with the roller table down. (See figure 14.) See that the hole in the staking tool is large enough to admit the roller jewel. Select a hollow punch of suitable size, put it in the staking tool over the balance staff, and force the staff down into the roller table by tapping the punch lightly with your watch makers' hammer No. 3200. Be sure to have the top of the roller table facing the balance wheel so that the roller jewel points down toward the lower end of the balance staff as shown in figure 15. You now put on the hairspring. Have the hairspring stud opposite the mark you made on the rim of the balance wheel. When the position is correct, fasten it in place with a hollow punch as you did the roller table.

Paragraph No. 8

Testing the Escapement

❡ Before proceeding any further, it is necessary to test the escapement. This term applies to the escape wheel and pallet fork and arbor. Wind the watch movement with your bench key until the power from the mainspring seeks an outlet through the escape wheel. Do not turn the key more than three or four times. The motive power derived from the mainspring is held in check by the pallet when it reaches the escape wheel. If the pallet was removed, the watch would run down instantly. The pallet stones interlock with the teeth in the escape wheel and releases them one at a time, when the pallet vibrates. (See figure 16.) To demonstrate this principle, touch the pallet fork with the point of your tweezer. If the watch movement is in running order, the fork will immediately spring to the opposite supporting pin and the pallet will have released one tooth of the escape wheel. The fork will rest on the pin until you touch it again, when it should spring back to its original position. This second vibration will allow the pallet to release another tooth in the escape wheel. The two pins that regulate the throw of the pallet fork are called banking screws. They are formed so that the movement of the pallet fork can be adjusted. (See figure 17.) The proper adjustment of the banking screws is important. The pallet fork is vibrated by the roller jewel and the space between the banking screws must be wide enough to allow the roller jewel to perform its work without binding in the end of the pallet fork. The least friction or discord will prevent the watch from running. Do not change the adjustment of the banking screws until you know positively that they are not properly adjusted. More complete instructions pertaining to the escapement will be given with chart illustrations in the lessons that follow.

Paragraph No. 9

Putting the Balance Bridge in Position

❡ You now put the regulator, balance jewel and cap jewel in the balance bridge. Proceed as described in paragraph No. 1. Oil the balance jewel with your watch oiler, then place the balance bridge on your bench face down and put the balance wheel in position. Then put the hairspring stud in place and fasten it with the stud screw. See that the outer coil of the hairspring rests between the regulator pins, then grasp the balance bridge with your tweezer and hold it in position over the movement as shown in figure 18. When putting it in, see that the roller jewel enters the V shaped slot in the end of the pallet fork, then lower it into place and the movement will commence running. Before fastening the balance bridge with the balance bridge screw, be sure that the balance staff pivots are in the balance jewels and that nothing interferes with the motion of the balance wheel. After fastening the balance bridge, take hold of the balance wheel with your tweezers and test the end and side shake as described in paragraph No. 3.

Paragraph No. 10

How to Put the Movement in the Watch Case

¶ If the watch is open face, remove the bezel (this is the rim which holds the glass), then pull out on the crown and stem until you hear it click. Now hold the watch case in your left hand, face up. With the other hand you place the movement in the case, dial side up. See that the winding stem enters the winding pinion and that the case screws have been partly unwound with the flat side of the screw head parallel with the edge of the movement. After the movement slips into place, push the crown and stem back into position and see if it works properly. Then place your forefinger against the dial, to prevent the movement from slipping from the case, turn it over and fasten movement in with case screws.

¶ If it is a Hunting case watch, you must remove the crown and stem and watch bezel, as described in Lesson No. 1; then proceed as you would with an open face watch. Before replacing a bezel on a Hunting case watch, pull out the setting arm, then put on the bezel and push the setting arm back into position.

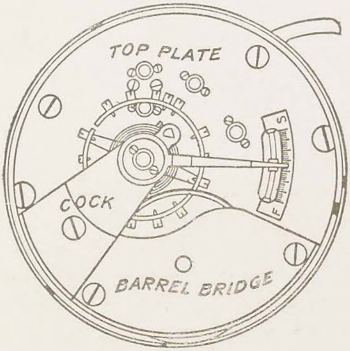
Paragraph No. 11

Examining a Watch Case

¶ You now examine the watch case. See that it closes properly and is free from dents; that, if a Hunting case, both lift and catch springs act securely. The lift spring may be poorly fitted. It should not throw back the lid with too much force or the joint will be injured. Try the winding and setting stem to see if the sleeve is in good condition. After the movement is fitted, see that the hands do not touch the glass both at the center and outer edge. If the minute hand or canon pinion has rubbed, a mark ground in the center of the glass will usually show it, or you can place your thumb nail close to the glass which will enable you to see clearly whether or not proper freedom exists. Open the back of the case, to see that any part of the movement does not touch the dome of the case when it is fitted and that the case screws properly to secure the movement. Always clean the case with your watch brush and polish the inside of the lids with rouge and chamois skin, before fitting the movement. If you have learned our three first lessons, the ones that follow will be comparatively easy, and you will experience no trouble when repairing watches from now on. You must be up to date and modern in all your ways of working. Cultivate the habit of concentrating your mind on the work in hand so that your thoughts will unconsciously precede your work. This habit once acquired will be of inestimable value to you.

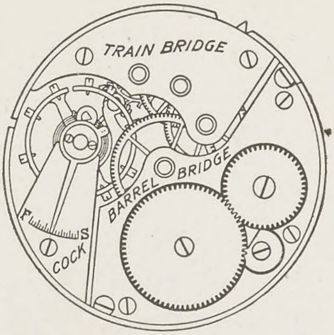
The Following Illustrations Show Exact Size of Watch Movements

℄ You can determine the exact size of watch movements by comparing them with these illustrations:



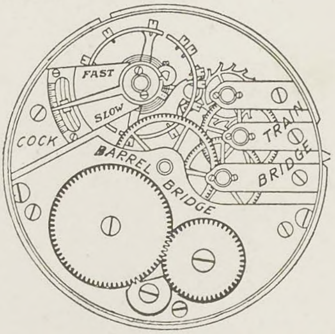
18 Size Full Plate

℄ Regular 18 size full plate watch movement, showing the barrel bridge, balance cock, top plate, regulator, jewels and screws in their proper position. A watch movement with all of the train wheels covered by the top plate so that they are not exposed is called a full plate model.



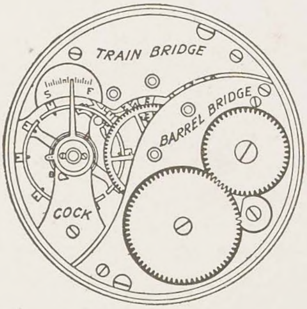
16 Size Three Quarter Plate

¶ Regular 16 size three quarter plate watch movement, showing the train bridge, barrel bridge, balance cock, winding wheels, balance wheel, hairspring regulator, train wheels, jewels and screws in their proper positions. A watch movement made with the train bridge exposing the train wheels and pallet fork and arbor is called a three quarter plate model.



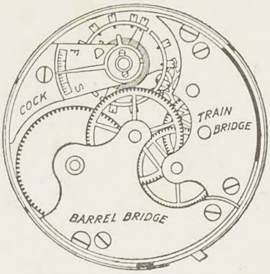
16 Size Bridge Model

¶ Regular 16 size bridge model watch movement, showing the barrel bridge, train bridge, balance cock, winding wheels, balance wheel, regulator train wheels and pallet fork and arbor. Also the jewels and screws in their proper position. A watch movement made with a separate bridge for each train wheel, as shown in this illustration, is called a bridge model.



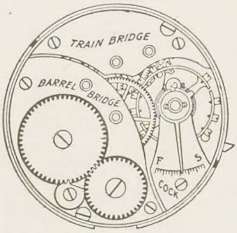
12 Size Three Quarter Plate

¶ Regular 12 size three quarter plate watch movement, showing the train bridge, barrel bridge, winding wheels, balance cock, balance wheel, regulator train wheels, jewels and screws in their proper position. This movement is a three quarter plate model, because the train wheels and escapement are exposed. The model is very similar to the 16 size three quarter plate movement.



6 Size Three Quarter Plate

℄ Regular 6 size three quarter plate watch movement, showing the barrel bridge, train bridge, balance cock and all of the train wheels, jewels and screws in their proper position. The wheels in this movement are only partially covered by the train bridge and barrel bridge. It is therefore called a three quarter plate model.



O Size Three Quarter Plate

℄ Regular 0 size three quarter plate watch movement, showing the barrel bridge, train bridge, balance cock, winding and train wheels, also the regulator jewels and screws in their proper position. This movement is called a three quarter plate model because the train wheels are exposed similarly to those in 6 size three quarter plate watch movements.

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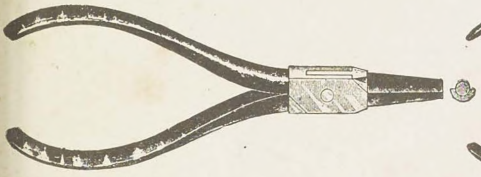

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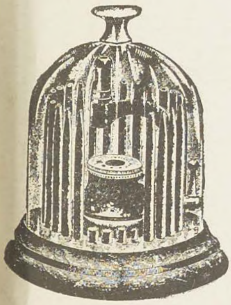

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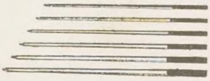

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